## *Remarks*

Allowed claims 2-4 (final claims 1-3) have been cancelled. These claims were cited in a provisional double patenting rejection of claims in application 09/623,068 in a recent Office Action (dated 12/29/2003) for application 09/623,068. Since these claims are no longer pending, these claims are no longer a basis for the provisional double patenting rejection for application 09/623,068.

New claim 5 has been added. New claim 5 is similar to original claim 1, which was previously canceled. Since original claim 1 was rejected in a First Office Action (dated April 3, 2003), the applicants respectfully offer the following arguments regarding patentability of inventions within the scope of new claim 5. The arguments are directed to the points in the First Office Action.

Regarding point 1 (page 2). The Examiner states: "The title of the invention is not descriptive". The applicants respectfully disagree. The invention is directed to "A CL-F polymorphism display". The invention is therefore directed to a two-dimensional linkage study technique that uses the two dimensions of chromosomal location (CL) and least common allele frequency (F). The present title of the invention is "TWO-DIMENSIONAL LINKAGE STUDY METHODS AND RELATED INVENTIONS". Applicants respectfully submit that the invention is related to two-dimensional linkage study methods.

In addition, the applicants are requesting continued examination with a 3 month suspension of action. <u>And the applicants respectfully intend (at the present time) to file claims in a preliminary amendment on or before the 3 month suspension of action period has elapsed.</u> Applicants respectfully submit that these new claims may also be directed to inventions of which the present title is indicative.

**Regarding point 2** (page 2). The following parts of the specification relate to "means plus function language" in new claim 5. See p. 38 lines 19 to 21: "In some versions, human interaction from a human operator with a mouse or similar device causes the LD data or association data (or both) between each of one or more pairs of polymorphisms to be displayed". See p. 39 lines 8 to 9: "in versions of the apparatus, the means of this sentence comprises a computer." See p. 39 line 10: "The apparatus comprise means for storing and updating data". See p. 39 line 14: "means for printing one or more graphs". See p. 58 lines 34 to 35 of Provisional Application 60/230570: "One or more species of each generic version of the invention that is a computer program cause data to be displayed by a Cathode Ray Tube, Liquid Crystal Display, Printer or similar physical device." (Provisional Application 60/230570 is incorporated by reference into the present application.)

**Regarding point 3** (page 2) There is no limitation in new claim 5 to a specific species of creature such as Heterodontosaurus tucki or a specific population.

**Regarding point 4** (page 3) Reference is made to US Patent 5,222,192, inventor Shaefer (referred to herein as the '192 patent). The subject matter of the '192 patent is directed to "genetic algorithms" in the field of computer science. The "genes" and "chromosomes" in the '192 patent are not chromosomes and genes in living creatures (or creatures that were alive), but are bits. See column 2 lines 45 to 50: "In a SGAO, the parameters of the function being optimized are represented by a population of so-called chromosomes. Each chromosome may be, for example, a string of bits (0s and 1s in the memory of a computer) with all chromosomes in the population having the same number of bits." The "chromosomes" and "genes" of the '192 patent are essentially similar to the chromosomes and genes (or gene structures) of the present application only in terminology or words, but not essentially in concepts. The '192 patent subject matter is directed to the solution of problems such as the "traveling salesman problem" (see column 1 line 18 and column 27 lines 59 to 60).
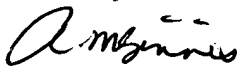
In addition, the '192 patent does not even contain the phrase "allele frequency", the word "frequency" or the concept of a two-dimensional graph having the two dimensions of chromosomal location (CL) and least common allele frequency (F). Whereas claim 5 is directed to an apparatus for displaying such a two-dimensional graph for the polymorphisms of real creatures.

**Regarding point 5** (page 4) Reference is made to US Patent 6,291,182, inventors Schork, et. al. (referred to herein as the '182 patent). The '182 patent is, however, directed to methods and apparatus that appear to use "genomic regions" that are essentially one dimensional. See for example column 1 lines 58 and 62 and column 2 lines 28, 31, and 55, as well as figures 4, 5 and 6. Figures 4, 5 and 6 essentially represent evidence for association graphed against chromosomal location (see column 3 lines 57 to 62). Allele frequency ("allelic frequencies") in the '182 patent is generally used for comparison between patients who are cases (express the trait) and patients who are controls (do not express the trait), a standard technique (see column 1 lines 54 to 57).

There is no teaching in the '182 patent of the increase in power of an association-based linkage test due to the similarity of the allele frequencies of a marker and trait-causing polymorphism. There is also no teaching in the '182 patent of the concept of a two-dimensional graph having the two dimensions of chromosomal location (CL) and least common allele frequency (F). Whereas claim 5 is directed to an apparatus for displaying such a two-dimensional graph for the polymorphisms of real creatures.

Additionally, the use of a printer or display in the '182 patent is "for notifying a computer user of the results of a particular process", such as a process illustrated in figures 18 through 25. See for example column 36 lines 3 to 5 or column 37 lines 8 to 11. The use of a printer or display in the '182 patent at column 42 lines 6 to 9 is for displaying the results in tabular form of the comparison two distributions (see column 41 lines 57 to 65). Such a display is not of a two-dimensional graph having the two dimensions of chromosomal location (CL) and least common allele frequency (F). Whereas claim 5 is directed to an apparatus for displaying such a two-dimensional graph for the polymorphisms of real creatures.

Sincerely,

Robert O. McGinnis, Agent of Record, Reg. No. 44, 232